General Directions: This is a collaborative problem set. You may work with one other person and turn in a single set of solutions. There is a single answer sheet. You should attach to this answer sheet supporting documents, either from Excel, Winplot, or Mathematica. Label your attachments so you can refer to them in your explanation.

Attached, you will find an Excel file containing the monthly average temperatures for several cities around the world. In this problem you will be asked to model one of those cities using a sinusoidal function. When you have picked a partner (or not), ask your instructor which city you should model. The title to your graph in Excel should include the name of your city and be otherwise well labeled.

I. Using Excel, make a scatter plot of this data with your axes correctly labeled with description and units.

II. The temperature closely models a sinusoidal curve. Determine from the data and interpret the meaning of each of the following in the context of this situation:

a. amplitude

b. period

c. vertical shift

d. phase shift

III. a. Find a sinusoidal function that fits your set of data using the techniques you learned in the trig unit. Show your work. Write the function on your answer sheet, indicating the units of your independent and dependent variables.

b. Create a new column on your data table indicated your predicted values using the function you found. Plot these predicted results, connecting the points, on your scatter plot you made in part I. Note: your answers in part II will be slightly different than the one you found. 'Tweak' your answer by manually adjusting your values of the function to get a better fit. In Excel, calculate the residuals, the square of the residuals, and finally the sum of the squares of the residuals. Use the sum of the squares of the residuals to determine the best fit. Attach this Excel page to your problem set solutions. Include your data table with the graph. Make sure your graph is well labeled with a title and axes labeled.

c. Assume the averages on the table occurred in the middle of each month. What does your model predict the average temperature would be on Dec.25? Use your formula to do this problem and show your substitution that leads to your solution.

Month	Juneau	Moscow	LosAngeles	Anchorage	Oslo	Nairobi	Por-au-Prince	Chicago	Sydney	Tokyo
Jan	24.2	13.5	55.8	13.5	24.3	67.1	76.6	22.5	71.8	38.5
Feb	28.4	15.6	57.2	17.2	25.2	68.4	77.2	27	71.8	39.7
March	32.7	24.6	58.5	24.4	30.9	69.1	78.4	38.1	69.8	45.3
April	39.7	39.9	61.7	35.2	39.9	68.5	79.5	49.6	65.1	55.4
May	47	54	64.8	46.4	50.5	66.6	80.1	60.4	59.5	63.1
June	53	61.3	68.4	54	58.8	63.9	81.9	70.3	55.2	69.4
July	56	65.3	73	58.3	62.4	62.2	82.6	75	53.6	76.5
Aug	55	62.1	74.3	56.3	59.7	63	82	73.4	55.8	79
Sept	49.4	51.6	72.3	48.4	52	65.5	81.1	65.8	59.5	72.3
Oct	42.2	39.6	68	33.3	42.4	67.5	80.1	54.1	63.9	61.7
Nov	32	28.4	61.2	19.8	32.9	66.7	78.8	41.4	67.1	52
Dec	27.1	18.5	55.9	14.9	26.8	66.7	77.4	28.2	70.2	43